# UNITED STATES PATENT AND TRADEMARK OFFICE

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/020,134 | 12/18/2001 | Bijit Halder | 56162.000358 | 9579 |

| | |
|---|---|
| 7590          09/07/2005 | EXAMINER |

Kevin T. Duncan, Esq.
Hunton & Williams
Intellectual Property Department
1900 K Street, N.W., Suite 1200
Washington, DC 20006

| EXAMINER |
|---|
| HAROLD, JEFFEREY F |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2646 | |

DATE MAILED: 09/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| | Application No. | Applicant(s) |
|---|---|---|
| | 10/020,134 | HALDER ET AL. |
| / **Office Action Summary** | Examiner | Art Unit | |
| | Jefferey F. Harold | 2646 | |

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on <u>24 May 2005</u>.

2a)☐ This action is **FINAL**.      2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *2-12,14-21,23-33 and 35-50* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-4,6,9-12,14-16,20,21,23,24,27,30,31,35-37 and 41-50* is/are rejected.

7)☒ Claim(s) *5,7,8,17-19,25,26,28,29,33 and 38-40* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1.      *Claims 2, 3, 4, 6, 9, 10, 11, 12, 14, 15, 16, 20, 21, 23, 24, 27 30, 31, 35-37, 41*

*and 42* are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (United

States Patent 6,590,976) in view of Farhang-Boroujeny et al. (United States Patent

6,853,626), hereinafter referenced as Farhang-Boroujeny.

Regarding **claim 3**, Lin discloses a dual rate echo canceller for applications with

asymmetric transmit and receive rates, the echo canceller comprising:  an echo

canceller filter having an input adapted to receive a transmit signal from a transmit path

at an input, the echo canceller filter being adapted to generate an output signal

comprising a signal component representative of an echo signal associated with the

transmit signal at an output, wherein the input and the output of the echo canceller filter

are sampled at a transmit rate; a first rate matching block having an input adapted to

receive the echo cancellation filter output signal, the first rate matching block being

adapted to generate a first output, the first output being subtracted from an incoming

receive signal yielding a residue echo signal at a receive rate; and a second rate

matching block having an input adapted to receive the residue echo signal, the second

rate matching block being adapted to generate an error signal at the transmit rate, the

first rate matching block further comprising an up sampling block having an input

adapted to receive the output signal of the echo canceller the up sampling block being

adapted to generate an up-sampled signal, as disclosed at column 4, line 1 through

column 5, line 9 and exhibited in figures 3-6, however, Lin fails to disclose up sampling

by a zero filling operation. However, the examiner maintains that it was well known in

the art to provide up sampling by a zero filling operation, as taught by Farhang-

Boroujeny.

In a similar field of endeavor Farhang-Boroujeny discloses a method and

apparatus for echo cancellation in an asymmetric communication system. In addition,

Farhang-Boroujeny discloses up sampling by zero filling operation, as disclosed at

column 4, lines 24-29.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to modify Lin by specifically providing up sampling by zero

filler operation, as taught by Farhang-Boroujeny, for the purpose of providing a

continuous stream of samples.

Regarding **claim 2**, Lin and Farhang-Boroujeny disclose everything claimed as

described above (see claim 3), in addition, Lin discloses wherein the receive rate is

greater than the transmit rate, as exhibited in figures 3-5.

Regarding **claim 4**, Lin and Farhang-Boroujeny disclose everything claimed as

described above (see claim 3), however, the combination fails to disclose an

interpolation filter having an input adapted to receive the up sampling signal, the

interpolation filter being adapted to generate a filtered signal, wherein the interpolation

filter is a low pass filter. However, the examiner maintains that it was well known in the art to provide an interpolation filter having an input adapted to receive the up sampling signal, the interpolation filter being adapted to generate a filtered signal, wherein the interpolation filter is a low pass filter, as taught by Farhang-Boroujeny.

In a similar field of endeavor Farhang-Boroujeny discloses a method and apparatus for echo cancellation in an asymmetric communication system. In addition, Farhang-Boroujeny discloses an interpolation filter having an input adapted to receive the up sampling signal, the interpolation filter being adapted to generate a filtered signal, wherein the interpolation filter is a low pass filter up sampling by zero filling operation, as disclosed at column 6, lines 1-19.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination by specifically providing an interpolation filter having an input adapted to receive the up sampling signal, the interpolation filter being adapted to generate a filtered signal, wherein the interpolation filter is a low pass filter, as taught by Farhang-Boroujeny, for the purpose of providing a continuous stream of samples.

Regarding **claims 6, 12, 16, 24, 27 and 37**, they are interpreted and thus rejected for the reasons set forth above in the rejection of claim 3.

Regarding **claim 9**, the combination discloses everything claimed as applied above (see claim 3), however, the combination fails to disclose wherein the error signal is used to adaptively train at least one coefficient of the echo canceller. However, the examiner maintains that it was well known in the art to provide wherein the error signal

is used to adaptively train at least one coefficient of the echo canceller, as taught by
Farhang-Boroujeny.

In addition, Farhang-Boroujeny discloses wherein the error signal is used to
adaptively train at least one coefficient of the echo canceller, as exhibited in figure 2.

Therefore, it would have been obvious to one of ordinary skill in the art at the
time the invention was made to modify the combination by specifically providing wherein
the error signal is used to adaptively train at least one coefficient of the echo canceller,
as taught by Farhang-Boroujeny, for the purpose of providing a canceling the echo in
the signal.

Regarding **claim 10**, the combination discloses everything claimed as applied
above (see claim 9), however, the combination fails to disclose wherein lest mean
square update rules are used to adaptively train the a least one coefficient. However,
the examiner maintains that it was well known in the art to provide wherein lest mean
square update rules are used to adaptively train the a least one coefficient, as taught by
Farhang-Boroujeny.

In addition, Farhang-Boroujeny discloses wherein lest mean square update rules
are used to adaptively train the a least one coefficient, as disclosed at column 5, lines
42-65.

Therefore, it would have been obvious to one of ordinary skill in the art at the
time the invention was made to modify the combination by specifically providing wherein
lest mean square update rules are used to adaptively train the a least one coefficient, as

taught by Farhang-Boroujeny, for the purpose of providing a canceling the echo in the signal.

Regarding **claims 20, 21, 30, 31, 41 and 42**, they are interpreted and thus rejected for the reasons set forth above in the rejection of claims 9 and 10 respectively.

Regarding **claim 11**, Lin and Farhang-Boroujeny disclose everything claimed as described above (see claim 3), in addition, Lin discloses wherein the receive rate is equal to a multiple of a transmit rate by a factor, as exhibited in figures 3-5.

Regarding **claim 14**, Lin and Farhang-Boroujeny disclose everything claimed as described above (see claim 16), in addition, Lin discloses wherein the echo cancellation filter is an adaptive finite impulse response filter, as exhibited in figure 6.

Regarding **claim 15**, Lin and Farhang-Boroujeny disclose everything claimed as described above (see claim 16), in addition, Lin discloses wherein a transmit rate is greater than the receive rate, as exhibited in figures 3-5.

Regarding **claim 23**, Lin and Farhang-Boroujeny disclose everything claimed as described above (see claim 24), in addition, Lin discloses wherein the receive rate is greater than the transmit rate, as exhibited in figures 3-5.

Regarding **claim 35**, Lin and Farhang-Boroujeny disclose everything claimed as described above (see claim 37), in addition, Lin discloses wherein the step of enerating an echo signal further comprises implementing an adaptive finite impulse response filter, as exhibited in figure 6.

Regarding **claim 36**, Lin and Farhang-Boroujeny disclose everything claimed as

described above (see claim 37), in addition, Lin discloses wherein a transmit rate is

greater than the receive rate, as exhibited in figures 3-5.

2.    **Claims 43-50** are rejected under 35 U.S.C. 103(a) as being unpatentable over

Lin in view of Farhang-Boroujeny and further in view of Widrow et al. (Adaptive Signal

Processing) and further in view of Dowling (United States Patent 6,522,688).

Regarding **claim 43**, as disclosed above the combination of Lin and Farhang-

Boroujeny makes obvious all elements except the use of the Hankel matrix. Dowling

discloses the use of the Hankel matrix in an echo canceller (column 26, lines 1-10). It

would have been obvious to one skilled in the art at the time of the invention to apply

the Hankel matrix as taught by Dowling to the combination made obvious by Lin,

Farhang-Boroujeny, and Widrow for the purpose of optimizing the performance of the

echo canceller.

Regarding **claim 44**, the combination discloses everything claimed as recited

above (see claim 43), Farhang-Boroujeny further discloses an error signal (Fig. 2,

reference ERROR) that corresponds to the error signal claimed and results from the

subtraction from a receive signal (Fig. 2, output of 238) of an input signal (i.e., X)

subjected to an upsample process (i.e., $h^T$) and a weight vector (i.e., W).

Regarding **claim 45**, the combination discloses everything claimed as recited

above (see claim 43), Lin and Farhang-Boroujeny disclose use of an LMS Algorithm,

however, the combination is silent as to the update formula used. Widrow discloses an

LMS update formula: $W_{k+1} = W_k + 2\mu\varepsilon kX_k$ (Page 100, eq. 6.3) where W is the weight

vector that corresponds to the coefficient vector claimed, X is the vector of input

samples that corresponds to the data vector claimed, g is the gain constant that

corresponds to the step size claimed and E is the error signal per equation 2.8, page

19. Widrow further discloses this formula practical, elegant, simple and efficient. It

would have been obvious to one skilled in the art at the time of the invention to apply

the update formula taught by Widrow to the combination made obvious by Farhang-

Boroujeny and Lin for the purpose of realizing the aforesaid advantages.

Regarding **claim 46**, the combination discloses everything claimed as recited

above (see claim 45), Farhang-Boroujeny further discloses an error signal (Fig. 2,

reference ERROR) that corresponds to the error signal claimed and results from the

subtraction from a receive signal (Fig. 2, output of 238) of an input signal (i.e., X)

subjected to an upsample process (i.e., h $^T$) and a weight vector (i.e., W).

Regarding **claims 47-50**, they are interpreted and thus rejected for the reasons

set forth above in the rejection of claims 43-46.


### *Allowable Subject Matter*

3.    The indicated allowability of **claims 3, 4, 6, 12, 16, 24, 27, 37, and 43-50** is

withdrawn in view of the newly discovered reference(s) to Farhang-Boroujeny, Widrow

and Dowling. Rejections based on the newly cited reference(s) are disclsosed above.

4.    **Claims 5, 7, 8, 17, 18, 19, 25, 26, 28, 29, 33, 38, 39, 40** are objected to as being

dependent upon a rejected base claim, but would be allowable if rewritten in

independent form including all of the limitations of the base claim and any intervening

claims.

## *Conclusion*

5.     Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Jefferey F. Harold whose telephone number is 571-272-

7519.  The examiner can normally be reached on Monday - Friday 9 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Sinh H. Tran can be reached on 571-272-7564.  The fax phone number for

the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system.  Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).

Jefferey F Harold
Primary Examiner
Art Unit 2646

JFH
September 1, 2005